

CLAIMS

What is claimed is:

- 1 1. A bandgap reference circuit comprising:
 - 2 a transistor having an emitter, a collector, and a base;
 - 3 a first resistor and a second resistor, where the first resistor is coupled
 - 4 between the collector and the second resistor;
 - 5 a proportional to absolute temperature (PTAT) current source for
 - 6 providing a PTAT current, where the PTAT current source is
 - 7 coupled to a node between the first resistor and the second resistor;
 - 8 where a reference voltage is generated at the node between the first
 - 9 resistor and the second resistor.
- 1 2. The bandgap reference circuit of claim 1, further comprising:
 - 2 a bias current source for providing a bias current to the transistor.
- 1 3. The bandgap reference circuit of claim 1, where the base is coupled to the
- 2 collector.
- 1 4. The bandgap reference circuit of claim 3, where the second resistor couples
- 2 between the first resistor and ground.
- 1 5. The bandgap reference circuit of claim 4, where the emitter is coupled to ground.

- 1 6. The bandgap reference circuit of claim 1, where the reference voltage remains
2 substantially constant in response to variations in temperature.
- 1 7. The bandgap reference circuit of claim 1, where the transistor is a bipolar
2 transistor.
- 1 8. The bandgap reference circuit of claim 7, where the bipolar transistor comprises
2 silicon and germanium.
- 1 9. The bandgap reference circuit of claim 1, where the bandgap reference circuit is
2 part of a wireless communications device.
- 1 10. A method for providing a reference voltage, comprising:
2 providing a transistor having an emitter, a collector, and a base;
3 providing a first resistor and a second resistor, where the first resistor is
4 coupled between the collector and the second resistor;
5 providing a proportional to absolute temperature (PTAT) current, where
6 the PTAT current source is received by a node between the first
7 resistor and the second resistor;
8 where a reference voltage is generated at the node between the first
9 resistor and the second resistor.
- 1 11. The method of claim 10, further comprising:
2 providing a bias current to the transistor.
- 1 12. The method of claim 10, where the base is coupled to the collector.

U.S. Express Mail No.
Filing Date:

PATENT
TKHR Docket No. 050323-1010
01CXT0166W

- 1 13. The method of claim 12, where the second resistor couples between the first
2 resistor and ground.
- 1 14. The method of claim 13, where the emitter is coupled to ground.
- 1 15. The method of claim 10, where the reference voltage remains substantially
2 constant in response to variations in temperature.
- 1 16. The method of claim 10, where the transistor is a bipolar transistor.
- 1 17. The method of claim 16, where the bipolar transistor comprises silicon and
2 germanium.
- 1 18. A method for providing a reference voltage, comprising:
2 providing a base-emitter voltage;
3 providing a first current that varies in proportion to the base-emitter
4 voltage;
5 providing a second current that is proportional to absolute temperature
6 (PTAT);
7 routing the first current and a portion of the second current through a
8 second resistor thereby generating a reference voltage V_{ref} that is
9 substantially constant in response to variations in temperature.
- 1 19. The method of claim 18, where:
2 the base-emitter voltage is provided by a transistor having an emitter, a
3 collector, and a base;
4 a first resistor is coupled between the collector and the second resistor;

5 the PTAT current source is received by a node between the first resistor
6 and the second resistor;
7 the reference voltage V_{ref} is generated at the node between the first resistor
8 and the second resistor.

- 1 20. A bandgap reference circuit comprising:
2 a diode having an anode and a cathode;
3 a first resistor and a second resistor, where the first resistor is coupled
4 between the anode and the second resistor;
5 a proportional to absolute temperature (PTAT) current source for
6 providing a PTAT current, where the PTAT current source is
7 coupled to a node between the first resistor and the second resistor;
8 where a reference voltage is generated at the node between the first
9 resistor and the second resistor.
- 1 21. The bandgap reference circuit of claim 20, further comprising:
2 a bias current source for providing a bias current to the diode.
- 1 22. The bandgap reference circuit of claim 20, where the second resistor couples
2 between the first resistor and ground.
- 1 23. The bandgap reference circuit of claim 20, where the emitter is coupled to ground.
- 1 24. The bandgap reference circuit of claim 20, where the reference voltage remains
2 substantially constant in response to variations in temperature.